and in nothing perhaps is it more grateful than in the reminiscences it brings to our homes of its wilder associates far afield; for Starlings consort with many kinds of birds, learn their notes and frequently mingle them in their own strain."

And then as a foot-note:—

"Thus the well-known wail of the Lapwing, and the piping note of the Ringed Plover may be heard in places wholly unsuited to the habits of those birds. Messrs. Matthews mention Starlings imitating the cry of the Kestrel, Wryneck, Partridge, Moorhen, and Coot among other birds (Zool. p. 2430). Saxby says that in Shetland the notes of the Oyster-catcher, Golden Plover, Redshank, Curlew, Whimbrel, and Herring-Gull, are perfectly mimicked. Mr. Hooper, of Upton near Didcot, informs the editor that Starlings in that neighbourhood will render exactly the characteristic cry of the Quail and the Corn-Crake. The common sounds of the poultry-yard are often copied with more or less accuracy, and a Duck may be heard to quack, a Hen to cackle, and a Cock to crow from the topmost bough of a tall tree."

It follows that if a Starling can so well imitate the notes of the above-named birds, it would have still less difficulty with those of species much more nearly allied to it, as the Blackbird, Chaffinch, and Sparrow. ALFRED NEWTON

Magdalene College, Cambridge, March 9

The "Geographical" and the Public

QUITE accidentally this evening I noticed in NATURE that Capt. Evans was to read a paper on the Magnetism of the Earth, before the Royal Geographical Society at the London University. Having devoted considerable attention to the subject I was desirous of hearing the paper and hurried up to town. I found, however, that I could not obtain admittance without an order. I offered payment but that was useless. I explained to the doorkeeper that I had come a long distance, was most anxious to hear the paper, and did not know until then the terms of admission, otherwise, as many of my friends are Fellows, I would have supplied myself with the necessary order.

I offered my card and suggested that it might be sent in to Sir Henry Rawlinson, to whom I was known, or to the Secretary or some other official, but to all my endeavours there was a curt, not to say pert, reply.

It occurred to me that if I waited a short time some friend might possibly make his appearance and help me in my "pursuit of knowledge under difficulties." I had not waited many moments when I noticed the door-keeper despatch on an errand a lad who supported him. I was weak-minded enough to imagine he had relented, and that some official would come to my aid. An official did certainly come back with the lad—it was a policeman! who gave me a look which I interpreted to mean, "If you don't be off I'll 'run you in.'" A few words in a very low tone passed between the doorkeeper and himself, and as I had no desire to spend the night in Vine Street station, I departed, feeling that this was an *argumentum ad hominem* which I could not resist. X.

Temple, March 11

Hearing and Smell in Insects

ALL that I have observed leads me to believe that any sensitiveness shown by insects to sound is due to a diffused sensibility to vibration rather than to a differentiated sense like our own. This will sufficiently explain the behaviour of J. C.'s moths (NATURE, vol. xvii. p. 45), and my own larvæ (NATURE, vol. xvii. p. 102). In the one case the ringing glass, and in the other the vibrant wood of the feeding-box communicated the alarm. If anyone, an hour after his kitchen has been left in darkness and quiet, will enter it as gently as possible, without shoes or light, and then, having no contact with anything, other than the unavoidable one of his sock-muffled feet with the floor, will speak suddenly and sharply, I believe he will find that not a cockroach shows any signs of alarm. If, on the other hand, he should drop something heavy abruptly, or enter with his usual step in boots, there is a stampede; but even then nothing to compare with the commotion caused by the introduction of light.

As to smell, there can be no doubt, it seems to me, that it is a very finely-differentiated sense; residing, I suspect, to a great extent, in the antennæ, and probably capable of detecting qualities in substances of which our own analogous sense gives us no warning. The ichneumon flies are an example in point. One of the larger of these alighted inside my open window in the sunshine this afternoon, and I noticed, as often before, the incessant play of his antennæ as he hunted restlessly to and fro, apparently in search of larvæ, or pupæ, concealed under the wood. As the prey of some members of this tribe are always so hidden, and the egg is accurately laid therein, by means of the long ovipositor, without the aid of sight, some other sense, in great perfection, must guide them in their quest. But here is a quite conclusive instance.

I saw in Athens, March, 1864, in the collection of Mr. Merlin, then our vice-consul there, placed in juxta-position in one drawer in his cabinet, a wasp and spider, of which he told me that that species of spider is the habitual prey of that species of wasp, and that he hunts him by scent, nose down, precisely like a hound. He witnessed himself the chase from beginning to end in the case of the actual specimens I saw. It occurred in his own house, and was continued for some time, and across, as I understood him, more than one room. The spider, as soon as he found himself marked down, showed the greatest terror, running hither and thither, with many doubles and turns. These the wasp—a long, thin-bodied variety—followed accurately, turn by turn, never quitting the spider's track for an instant, recovering, when at fault, like a dog, until, after an exciting chase, he seized his exhausted prey, and the keenly-interested human observer secured both pursuer and victim. HENRY CECIL

Bregner, Bournemouth, March 2

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF JULY 29.—Prof. Newcomb has lately issued empirical corrections to Hansen's Lunar Tables, which he proposes to employ in the American Ephemeris for 1883. The errors of the tables have now attained such magnitude, and exhibit so steady an increase, that it becomes necessary to apply corrections, even though they may be of the otherwise unsatisfactory nature of empirical quantities, and it is probable that Prof. Newcomb may not be the only superintendent of an ephemeris who will adopt this course pending the formation of new lunar tables at, it may be hoped, no distant period.

At the time of the total solar eclipse which traverses the United States in July next, Mr. W. Godward finds the correction of the longitude of the moon deduced from Hansen's tables to be $-9''\cdot5$, and the correction of the latitude $+0''\cdot9$, according to Newcomb. Applying these corrections to the moon's place, and adopting Leverrier's diameter of the sun, with a somewhat reduced diameter of the moon from that given by Hansen's tables, which corresponds well in the calculation of eclipses, the following equations are found, which may be expected to give the times of beginning and ending of the total phase with considerable accuracy for any point not far distant from Denver, Colorado, the most important place traversed by the belt of totality.

$$\text{Cos}\, w = 59\cdot7050 - [1\cdot85211] \sin l + [1\cdot71204] \cos l, \cos (L + 216^\circ\ 48'\cdot2)$$

$$\begin{aligned} t = 9\text{h. } 54\text{m. } 34\cdot2\text{s. } &\mp [1\cdot93963] \sin w - [3\cdot56966] \sin l \\ &- [3\cdot82402] \cos l, \cos (L + 256^\circ\ 25'\cdot6). \end{aligned}$$

Here l is the *geocentric* latitude of the point, L its west longitude from Greenwich, to be used with a *negative* sign, and the quantities within square brackets are logarithms; t is the Greenwich mean time of beginning or ending of totality, according as the upper or lower sign of the second term is used, $[1\cdot93963] \sin w$ representing the semi-duration of the total phase; and applying the longitude of the place for which we are calculating in the usual way, the local mean times result.

As an example of the method of using formulæ of reduction similar to the above, which is frequently a matter of doubt to the uninitiated, we may find from them the local mean times of beginning and ending of the total eclipse in 106° 14′ W., and 40° 23′ N., which, according to the *Nautical Almanac* elements, is the position of the central eclipse at 10h. 28m. Greenwich mean time.

The reduction of the geographical to the geocentric

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latitude (which may be taken from tables found in many astronomical works—in Loomis's "Practical Astronomy," for instance, or in the *Berliner Jahrbuch* for 1852) is − 11′·4 and consequently $l = 40° 11′·6$.

W. long.	− 106° 14′	... ...	− 106° 14′
Constant	+ 216° 48′·2	... ...	+ 256° 25′·6
A	+ 110° 34′·2	B ...	+ 150° 11′·6

Constant ...	− 1·85211	Constant ...	+ 1·71204
Log. sin l ...	+ 9·80981	Log. cos l ..	+ 9·88302
		Log. cos A ...	− 9·54574
	− 1·66192		
			− 1·14080
No.	− 45·9111		
	− 13·8293	No.	− 13·8293
	− 59·7404		
Constant ...	+ 59·7050		
Sum	− 0·0354		
Log. cos w ...	− 8·54900		
w	92° 1′·7		

Constant	1·93963	Constant	−3·56966	Constant	−3·82402
Log. sin w	9·99973	Log. sin l	+9·80981	Log. cos l	+9·88302
				Log. cos B	−9·93837
	1·93936		−3·37947		
					+3·64541
No.	87^{s}·0	No. ...	−2395^{s}·9		
			+4419^{s}·9	No. ...	+4419^{s}·9
			+2024·0		

	+ 33^{m} 44^{s}·0	
Constant	9^{h} 54^{m} 34^{s}·2	
G.M.T. of middle of totality	10^{h} 28^{m} 18^{s}·2	
Long. W, *in time*	7^{h} 4^{m} 56^{s}·0	
	3^{h} 23^{m} 22^{s}·2	
Semi-duration	1^{m} 27^{s}·0	
Totality begins	3^{h} 21^{m} 55^{s}·2	Local M.T.
,, ends	3^{h} 24^{m} 49^{s}·2	

The duration of the total eclipse is therefore 2m. 54s. and the middle at 10h. 28m. 18s. G.M.T.; the *Nautical Almanac* has 2m. 55s. and 10h. 28m., so that the corrections which we have introduced into the calculation have had but very insignificant effect. It may be added that when cos w is found greater than unity, and therefore impossible, the place for which the calculation is made is beyond the zone of totality.

THE STAR LALANDE 31266–7.—Mr. J. E. Gore writes with reference to this object, which in the reduced Catalogue of Lalande appears as a *first* magnitude, with position for 1800 (by a mean of the two observations), R.A. 17h. 1m. 22·36s., N.P.D. 45° 57′ 21″·6, and suggests that it may prove to be a remarkable variable, since it is "shown 6m. in Flammarion's edition of Dien's Atlas." The introduction of such a star into the Catalogue is easily explained, and in fact is rather an old story. The two observations on p. 353 of the "Histoire Céleste" were really observations of Capella (*Chèvre*, as Lalande calls it) *sub polo*, and were erroneously reduced to 1800, as though the star had been observed above pole. It is singular that these two observations should have given rise to the introduction of a spurious star, since there are eight other observations of Capella *sub polo* in the same year, 1790, between April 19 and July 24, of which no use has been made by the computers in their reduction of the stars of the "Histoire Céleste." There is no sixth magnitude in the position of the reduced catalogue.

MINOR PLANETS.—There are yet two more members to be added to this group—No. 184, discovered by Herr Palisa at Pola, on February 28, and No. 185, by Prof. Peters, at Clinton, U.S., on the following night. The *Berlin Circular*, No. 86, contains elements of Nos. 181–183.

BIOLOGICAL NOTES

INLAND FISHERIES, AMERICA.—We are indebted to Mr. Theodore Lyman, one of the United States Commissioners on Inland Fisheries, for an early copy of the Twelfth Annual Report to the Commonwealth of Massachusetts. Among other interesting facts we gather from it that there is still a mystery about the young of the Californian salmon (*Salmo quinnat*), for, notwithstanding the hundreds of thousands that have been put into New England waters, no one has been able to say with certainty that a single smolt has been seen. In reference to the true salmon (*S. salar*) it is pleasant to know that the return of mature salmon to the waters of the Merrimac last year (1877) commences a new era in the history of fish-culture in America. From the observations taken many of these mature salmon were from eight to ten pounds weight each, and were from the parr put into the river in 1873; but some were seen from fifteen to eighteen pounds weight, and these were most probably the result of the first parr put into the river in 1872. From 1872 to 1876 upwards of 830,000 parr were put into the river, and hundreds of fine fish were seen passing up in the spring of 1877; and, so says the report, "it will be seen that what we have so long fought for, what the mass of people here have generally considered mere theories, visions of men who suffered from fish on the brain, has been fully substantiated. It is true it took a little longer than was at first thought, but now Massachusetts knows that while she was the first of the States to take an interest in fish-culture, so she has been the first to demonstrate the certainty of a good return, and she can restock those rivers where the fish have been for a long time killed out."

THE DEVELOPMENT OF NERVES.—Dr. A. M. Marshall is continuing his careful researches into the earliest stages of nerves in vertebrate embryos. He has recently published in the *Quarterly Journal of Microscopical Science* some of his latest results, obtained from embryos of the common fowl, treated with picric acid. He describes a distinct neural ridge at the top of the cerebro-spinal tube in the middle cerebral track, before it has even closed in, the embryo being barely two days old in development. This ridge afterwards becomes continuous along the whole brain and great part of the spinal cord, and many of the nerves undoubtedly arise from it. It appears in the highest degree probable that the olfactory nerve originates from the anterior part of this ridge; but Dr. Marshall is quite certain that there is no special olfactory vesicle in the chick. This is directly contrary to the received teaching, which speaks of an olfactory lobe of the brain, and does not compare the olfactory with other nerves. Dr. Marshall believes that the common olfactory nerve is really the nerve of the anterior cranial segment. The third nerve is for the first time developmentally traced by Dr. Marshall, and he finds it to be a strictly segmental nerve. The seventh and eighth nerves (facial and auditory) are shown to have a common origin; the auditory is really a branch of the facial. The history of the vagus nerve (pneumogastric) is regarded as suggesting very strongly that it is equivalent to several spinal nerves, and not merely to one.

FRENCH POLYZOA.—An important contribution to the history of a number of species of marine polyzoa will be found in a memoir on "Les Bryozoaires des Côtes de France," by M. L. Joliet, of the Zoological Laboratory at Roscoff, a spot so well known to every tourist in Britanny.

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